Public Safety Management Plan LW107 to LW110

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1 INTRODUCTION

1.1 Overview

This Public Safety Management Plan (PSMP) has been prepared as part of the Extraction Plan for Longwalls Panels LW107 – LW110 in the Hoskissons Seam at the Narrabri Mine. This report addresses management objectives and performance measures to manage the potential subsidence impacts on public safety in relation to the Extraction Plan area.

A general description of the site locality and Extraction Plan area is provided in Section 1.1 of the Extraction Plan. The Extraction Plan describes the operation of the underground mine to date, and the proposed extraction of LW107 – LW110.

An updated assessment of potential subsidence movements related to Hoskissons Seam LW107 – LW110 has been prepared by Ditton Geotechnical Services (DGS, 2017). These subsidence predictions have been used as a basis for the updated assessment of impacts contained within the Extraction Plan. DGS's analysis and results are contained, in full, as an Appendix B to the Extraction Plan.

Land affected by LW107 – LW110 at the Narrabri Mine is all owned by Narrabri Coal Operations Pty. Limited (NCOPL). Potential safety risks that may occur as a result of subsidence include:

- Surface cracking;
- Ground deformations;
- Damaged infrastructure (i.e. damaged roads); and
- Loss of services.

Management actions relevant to built features where there are public safety implications are summarised in this management plan, however the actual management controls and incident response are addressed in the Built Features Management Plan (BFMP). Monitoring and repairs of surface cracking is covered by the Land Management Plan.

The primary risk management controls under this PSMP include regular communication with relevant stakeholders, monitoring of subsidence effects, and provision of appropriate warning signage at access points and around hazards as required.

1.2 Objectives

Specific objectives and performance outcomes that have been developed for the management of public safety are summarised below in Table 1.

Table 1: Public Safety Management Objectives and Performance Measures

Objectives	Performance Measure
- No additional safety risk. - To prevent personal injury as a result of subsidence impacts.	- No unmanaged risk to public safety as a result of mining operations. - No injuries or accidents occur as a result of subsidence impacts or subsidence damage. - All identified public safety risks are managed quickly and appropriately to avoid injury. - Any such safety incidents are recorded within the NCOPL occupational health and safety management system for appropriate follow up and corrective action, if required.

1.3 Statutory Requirements

This document has been prepared in accordance with Project Approval (PA) 08_0144, relevant legislation and guidelines, including the Department of Planning and Environment, (DP&E) '*Guidelines for the Preparation of Extraction Plans*', and in consultation with relevant government agencies as discussed below.

1.3.1 Project Approval

PA 08_0144 requires that NCOPL prepare a PSMP to the satisfaction of the Division of Resources and Energy (DRE) "*to ensure public safety in the mining area*." Specifically, Schedule 3, Condition 4(g) reads:

> *4. The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Secretary. This Plan must:*
>
> *(g) Include the following to the satisfaction of DRE:*
>
> - *A Public Safety Management Plan to ensure public safety in the mining area;*

In addition, Schedule 3, Condition 2 of PA 08_0144 requires that the performance measure of "no additional risk" be posed to public safety as a result of underground mining activities.

1.3.2 Mining Lease

Narrabri Mine's Mining Lease (ML) 1609 has been amended to include a reference to Extraction Plans, removing the requirements for a Subsidence Management Plan. ML 1609 includes a number of requirements of relevance to the management of subsidence and public safety.

Potential public safety risks have been identified in this Plan based on the site features and predicted subsidence, with management and monitoring measures proposed accordingly to minimise safety risks.

1.3.3 Work Health and Safety Legislation

This Extraction Plan – PSMP has been developed to comply with the Work Health and Safety legislation including but not limited to:

- *Work Health and Safety Act 2011*;
- *Work Health and Safety Regulation 2011*;
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013*; and
- *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Components of the Extraction Plan will be submitted to DRE as part of the High Risk Notification, required by the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*, for LW107 to LW110.

1.4 Stakeholders Consultation

For the purposes of notification and consultation, key stakeholders for the management of public safety associated with Narrabri Mine's LW107 – LW110 are listed in Table 2. Land ownership of the Extraction Plan area and surrounds is shown in Plan 5.

Prior to implementation (and should significant amendments to this document be required during mining) consultation with relevant stakeholders will be undertaken by NCOPL.

Table 2: Relevant Stakeholders and Representatives

Organisation	Representative	Phone	Postal Address
Division of Resources and Energy (DRE)	Director, Mine Safety Operations	02 4931 6644	PO Box 344 Hunter Regional Mail Centre, NSW 2310
Narrabri Mine	Technical Services Superintendent Environmental Superintendent	02 6794 4755	Locked Bag 1002, Narrabri NSW 2390

Note: There is no public infrastructure or public access into the Extraction Plan area and as such consultation with relevant stakeholders is limited to those noted in Table 2.

2 POTENTIAL SAFETY RISKS

2.1 Predicted Subsidence

For LW107 to LW110 the subsidence predictions have been modelled and predictions updated, which includes using the measured levels for LW101 to LW105 (DGS, 2017). Maximum predicted and observed subsidence values (worst-case scenarios) for extraction of these panels, as presented in Table 3, have been adopted for the purposes of this management plan.

Table 3: Maximum Subsidence Predictions

Longwall Panel	Final Maximum Subsidence (S_{max})	Maximum Tilt	Maximum Strain - Tensile	Maximum Strain - Compressive
Units	m	mm/m	mm/m	mm/m
LW107	2.75	44	13	16
LW108	2.75	38	10	13
LW109	2.75	33	9	11
LW110	2.75	30	8	10

Source: DGS, 2017.

Based on a review of the observed surface cracking for LW101 to LW105, surface cracks have typically ranged from 50 mm to 100 mm wide, with some cracking up to 200 mm. The measured cracks have therefore been within the predicted crack width ranges of between 40 mm and 220 mm in the approved Extraction Plan for LW101 to LW106. The revised cracking width range of 30 mm to 260 mm for LW107 to LW110 is therefore likely to be conservative and crack widths are expected to decrease with cover depth increases over LW107 to LW110 (DGS, 2017).

DGS (2017), Appendix B, outlines that based on reference to ACARP, 2003, the cracks will probably have developed by the time the longwall face has retreated past a given location for a distance equal to 1 to 2 times the cover depth. Cracks will usually develop within several days after a mine has retreated beneath a given location, with some of the cracks closing in the compression zone in the middle of the fully developed subsidence trough, together with new cracks developing in the tensile zones along and inside the panel sides several weeks later.

The cracks in the tensile strain zones will probably be tapered and extend to depths ranging from 5 to 15 m, and possibly deeper in near surface rock exposures. Cracks within compressive strain zones are generally low-angle shear cracks caused by failure and shoving of near surface strata. Some tensile type cracks can also be present due to buckling and uplift of near surface rock, if it exists (DGS, 2017).

The cracks usually develop in groups of two or three over a tensile zone of 20 m in width. Once the cracks develop, the strain is usually relieved in the adjacent ground, however, the topography and near surface geology also can influence the extent of cracking (DGS, 2017).

2.2 Affected Features

A layout of the proposed mine plan, affected surface features and predicted subsidence contours is included as Plan 2. Surface features relevant to public safety are discussed below.

2.2.1 Land

The subsidence effects summarised in Table 3 affects land owned by NCOPL, and as such is private land. No private or Government owned land exists within the Extraction Plan area for LW107 to LW110.

2.2.2 Roads

Private unsealed access roads and tracks, owned by NCOPL, occur across all four longwall panels. Portions of the former Narrabri Shire Council road, known as Greylands Road, that traverse ML 1609 have been purchased by NCOPL and this road is now maintained to allow access for mine-related traffic.

The unsealed gravel access roads and tracks above the proposed longwall panels are likely to be damaged by cracking and 'shoving' at tensile and compressive strain zones. Cracking and compression humps are likely to reduce the safe trafficability of all unsealed access roads, and impact the effectiveness of any longitudinal drainage (i.e. swales) or transverse pipe culverts that may be present.

Potential risks to traffic may result from either the cracking or compression humps, or through inadequate drainage resulting in aquaplaning during wet weather or accelerated erosion / pothole damage during wet weather

2.2.3 Public Utilities

No public utilities exist within the Extraction Plan area for LW107 to LW110.

2.2.4 Buildings and other structures

NCOPL-owned land over the proposed mining area includes residences and associated infrastructure within the 'Rosevale' and 'Greylands' properties, both of which are vacated. There are no privately-owned dwellings within the Extraction Plan area that will be subject to subsidence movements. The affected dwellings are located within LW107 (refer to Plan 2). The affected NCOPL-owned dwellings and associated structures are expected to be significantly damaged as a result of subsidence. Associated potential consequences include: building(s) no longer fit for purpose, personal safety risk (as a result of structural failure / damage), and release or stored effluent from the septic tank. These structures will be vacated and secured prior to undermining as described below.

2.2.5 Water Storage Dams

Numerous small farm water storage dams occur within the Extraction Plan area, all of which are owned by NCOPL. All are non-engineered structures, constructed using an earth embankment from local materials.

2.2.6 Fences and Gates

The land overlying LW107 – LW110 is divided by numerous fences and gates, delineating paddocks and controlling stock access.

2.3 Potential Risks

A subsidence risk assessment has been undertaken to identify the risks associated with subsidence at the Narrabri Mine. The initial risk assessment was undertaken during February 2012 for LW101 to LW105, was revised for LW106 and has subsequently been updated for to LW107 to LW110, refer to EP Appendix K. The updated risk assessment for LW107 to LW110 extraction has not identified any high risk items. As a result, risks associated with subsidence above LW107 to LW110 for the Narrabri Mine have been assessed as low to moderate.

Surface infrastructure affected by the extraction of LW107 – LW110 that may pose a threat to safety if damaged by subsidence, is summarised in Table 4 below. Table 4 also outlines the proposed management control for each identified potential safety risk. Many of these controls are documented in the BFMP. However, controls that specifically fall under the scope of this PSMP are further detailed and documented in Table 5.

2.4 Control Measures

For each of the risks identified with respect to public safety, controls have been developed to ensure that the level of risk is eliminated or reduced.

The actions proposed that will be implemented by Narrabri Mine to fulfil the consent conditions outlined in Section 1.3 and to meet the performance measures (objectives), outlined in Section 1.2, are shown in Table 5. These actions have been categorised into Monitoring, Management, Incident Response and Notification/Consultation.

Table 4: Subsidence Effects and Potential Risks

Surface Feature	Potential Subsidence Effect	Potential Safety Risk	Asset Owner / Stakeholder(s)	Control Measures	Reference
Land surface	Subsidence cracking of between 40 and 220 mm (generally).	Personal injury - trip/fall hazard, vehicle hazard. Individual trees may become unstable.	NCOPL	Erection of warning signage, road closure, communication with staff/contractors.	**Section 2**
				Temporary fencing.	**Section 2**
				Visual monitoring and repair of surface cracks.	Land MP
Roads	Surface cracking and ground deformation, formation of compression humps and dips and changes to drainage patterns.	Traffic hazard – vehicle accidents.	NCOPL	Erection of warning signage and communication with staff and contractors.	**Section 2**
				Inspection and implement repairs in response to observed impacts	BFMP
Water storage dams	Cracking of dam walls, loss of storage.	Dam wall failure resulting in sudden release of water – potential for personal injury if nearby.	NCOPL	Pre-mining assessment, monitoring, draining if required, and post-subsidence repair.	BFMP
Buildings	Potential structural instability rendering building unserviceable.	Building collapse or uneven structure– potential for personal injury if nearby.	NCOPL	Vacate dwelling and restrict access to buildings and surrounds until confirmed structurally sound, demolished or repaired.	BFMP
Fences and gates	Tilted fences / wire breakage / gates unable to open/close.	Livestock escape onto public roads (and potentially to Kamilaroi Highway to east) – traffic hazard.	NCOPL	Exclude from impacted areas/move livestock to unaffected area.	BFMP
				Install temporary fencing to control stock movements in event of existing fence damage.	BFMP

Table 5: Management, Monitoring and Responsibilities

Item	Action	Timing	Responsibility	Reporting / Status
1.0	Monitoring			
1.01	Inspection of affected areas to ensure that all safety controls identified in this Plan are in place and appropriate to the subsidence effects that are being observed.	As required – areas of active subsidence until final remediation of subsidence effects have been completed	All staff	Document internally
2.0	Management			
2.01	Visual monitoring of access roads and any affected internal access tracks to note any subsidence impacts that require remediation or implementation of additional traffic controls. Signage to warn of active subsidence.	On an as needs basis (access tracks/roads are used daily by mine personnel).	Environment Superintendent / Civil Services Coordinator	Document internally – see BFMP.
2.02	Where practicable, gates to NCOPL properties will be kept locked and external fencing erected to prevent unauthorised access, or alternatively, signage placed noting access restrictions (i.e. authorised visitors only) and potential hazards.	To be maintained throughout mining.	Environment Superintendent	Document internally
2.03	Residential buildings will be vacated prior to subsidence impacts occurring. These buildings and surrounds will then be secured to discourage unauthorised entry or use. Fencing should be located at a sufficient distance so as to prevent risk of personal injury in event of structural failure or falling debris. Services will be disconnected.	At least two weeks prior to subsidence impact.	Technical Services Superintendent	Document internally
2.04	Entry to all farm machinery and storage sheds will be restricted prior to and throughout active subsidence. Services will be disconnected.	For the period of active subsidence.	Technical Services Superintendent	Document internally
2.05	Where buildings are to be retained, site buildings will be inspected by a person(s) suitably qualified to assess the structural stability of the buildings. Buildings will only be returned to use once it is confirmed that the structures are sound and fit for purpose.	Following active subsidence and prior to reuse.	Technical Services Superintendent	Document internally
2.06	Buildings affected by subsidence will remain secured to prevent unauthorised access until such time as they are structurally assessed, demolished or repaired.	Following active subsidence. Demolished within 2 years.	Technical Services Superintendent	Document internally

Item	Action	Timing	Responsibility	Reporting / Status
2.07	Exclude stock from areas of active subsidence by relocation or temporary fencing as required.	In advance of longwall extraction.	Environment Superintendent	Document internally.
2.08	NCOPL or nominated contractor to rectify any impacts to property or livestock fences/gates.	Post-subsidence and prior to re-stocking.	Environment Superintendent	Document internally.
2.09	Consideration of public safety risks to be included as part of normal on-site risk assessments and reviews under the Narrabri Mine Health and Safety Management System.	Prior to subsidence impacts associated with this Extraction Plan.	Environment Superintendent	Document internally
3.0	**Incident Response**			
3.1	All subsidence related incidents will be managed in accordance with the Extraction Plan.	Near miss, injury or incident.	All staff	Incident reporting requirements to be included in site inductions
4.0	**Notification, Consultation & Reporting**			
4.1	Provide written notification (e.g. TBT) to mine personnel of the potential for subsidence impacts to access tracks/roads, advising of potential hazards, and including relevant contact details for further information the reporting of potential issues.	Annually.	Environment Superintendent	Document internally
4.2	Forward information to relevant stakeholders regarding progress of the longwall and any relevant subsidence management actions.	Annually.	Environment Superintendent	AR
4.3	Notify affected stakeholders if additional public safety risks resulting from NCOPL's operations are identified.	In response to monitoring	Environment Superintendent	Document internally

3 PLAN IMPLEMENTATION

3.1 Responsibilities

To ensure this management plan is implemented as intended, responsibilities have been assigned to relevant NCOPL personnel (see Table 5 and Table 6).

Table 6: Roles and Responsibilities

Roles	Responsibilities
Technical Services Superintendent	- Ensure this PSMP is implemented and adhered to.
	- Ensure that adequate resources are available to NCOPL personnel to facilitate the completion of their responsibilities under this management plan.
	- Authorise changes to this PSMP.
Environmental Superintendent	- Ensure that all monitoring and reporting is carried out within the timeframes specified, checked, processed and filed appropriately.
	- Liaise with stakeholders regarding subsidence impact management.

Though retaining the responsibilities identified above, these personnel may, at their discretion, delegate specific tasks to suitably qualified and experienced operational personnel or consultants.

3.2 Reporting

Regular reporting on the environmental performance of the project is placed on the Project website via the Community Consultative Committee – Environmental Monitoring Reports, in accordance with Schedule 6, Condition 5 of PA 08_0144.

In accordance with Schedule 6, Condition 6 of PA 08_0144, an Annual Review will be prepared and submitted to the Secretary that reviews the environmental performance of the project, including those relating to subsidence management.

3.3 Audit and Review

Schedule 6, Condition 3 of PA 08_0144 requires reviews of this Extraction Plan, and if necessary revisions, to be undertaken within three months of the following:

- Completion of an independent environmental audit required by Schedule 6, Condition 7;
- Submission of an Incident Report required by Schedule 6, Condition 4;
- Submission of an Annual Review Report required by Schedule 6, Condition 6; and
- Any modification to the conditions of this approval.

4 REFERENCES

Department of Planning and Environment, Unknown, Guidelines for the Preparation of Extraction Plans

Ditton Geotechnical Services (DGS) (2017) Mine Subsidence Assessment for the Proposed LW107 to LW110 Extraction Plan at the Narrabri Mine